



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

5.  $48\frac{7}{9} \times 49\frac{1}{2} = 2400\frac{697}{41}$ ;  $1295\frac{57}{3} \times 1296\frac{36}{3} = 1677615\frac{7343}{8649}$ .  
 6.  $7464 \times 7536 = 56248704$ ;  $88044 \times 87956 = 7744000000 - 1936$ .  
 7.  $2777\frac{7}{9} \times 4166\frac{2}{3} \times 666\frac{2}{3} \times 54 \times 24 \times 52 \times 7692307\frac{9}{3} \times 625 \times 125 \times 56 \times 32 \times 1428571428571428\frac{4}{7} \times 2083\frac{1}{3} \times 48 \times 833\frac{1}{3} \times 3125 \times 68543764287590 = \dots$

These and eleven other even longer computations are carried out mentally by Mr. Case.

The principle,  $a^2 = (a-b)(a+b) + b^2$ , may be used in the squaring of any number, though it is not so readily used if the numbers consist of more than two digits. Thus,

$$87^2 = (87-3)(87+3) + 3^2 = 84 \times 90 + 9,$$

$$92^2 = (92-2)(92+2) + 2^2 = 90 \times 94 + 4.$$

This is the principle used in several of Mr. Case's calculations. Thus,  
 $(5\frac{1}{2})^2 = (5\frac{1}{2} - \frac{1}{2})(5\frac{1}{2} + \frac{1}{2}) + (\frac{1}{2})^2 = 30\frac{1}{4}$ . ED. F.

330. Proposed by R. D. CARMICHAEL, Princeton, N. J.

An important function in the Theory of Numbers is one defined thus:  $f(x)=1$  when  $x>0$ ,  $f(x)=0$  when  $x=0$ ,  $f(x)=-1$  when  $x<0$ . Two analytic expressions for  $f(x)$  are the following:

$$f(x) = \lim_{n \rightarrow \infty} x^{1/(2n-1)}, \quad n=1, 2, \dots; \quad f(x) = \lim_{n \rightarrow \infty} \frac{(x+1)^n - (x+1)^{-n}}{(x+1)^n + (x+1)^{-n}}, \quad x > -1.$$

It is required to find other non-trigonometric analytic expressions for this function. (There are several representations of  $f(x)$  by means of trigonometric functions.)

Remark by the PROPOSER.

Professor F. H. Safford, of the University of Pennsylvania, has sent me the following expressions for the function defined in the problem:

$$\frac{2}{\pi} \int_0^\infty \frac{\sin xz}{z} dz, \quad \frac{2}{\pi} \int_0^\infty \frac{x dz}{x^2 + z^2}, \quad \text{Lim.}_{m \rightarrow +\infty} \frac{e^{xm} - e^{-xm}}{e^{xm} + e^{-xm}}.$$

333. Proposed by R. D. CARMICHAEL, Princeton University.

Sum the infinite series

$$\frac{1}{(m+1)^2} + \frac{(2m-1)}{(2m+1)^2} + \frac{(3m-1)^2}{(3m+1)^4} + \frac{(4m-1)^3}{(4m+1)^5} + \frac{(5m-1)^4}{(5m+1)^6} + \dots$$

[No solution of this problem has been received.]

334. Proposed by G. B. M. ZERR, A. M., Ph. D., Philadelphia, Pa.

$$\begin{aligned} &\text{Sum the series, } 2^n - n \cdot 2^{n-2} + \frac{n(n-3)}{2!} 2^{n-4} - \frac{n(n-4)(n-5)}{3!} 2^{n-6} \\ &+ \frac{n(n-5)(n-6)(n-7)}{4!} 2^{n-8} - \frac{n(n-6)(n-7)(n-8)(n-9)}{5!} 2^{n-10} + \dots \end{aligned}$$